



NanoScope Products

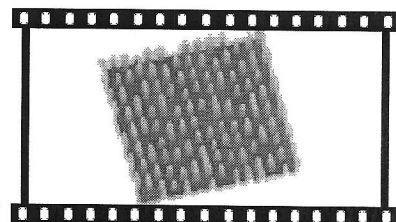


The Dimension™ 3100 Scanning Probe Microscope *Enter a New Dimension*

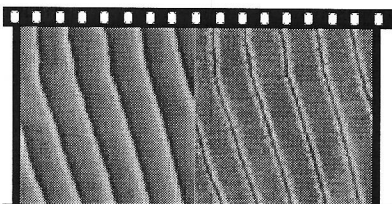


Since Digital Instruments introduced the first NanoScope® Scanning Probe Microscope (SPM) over a decade ago, SPMs have evolved from laboratory curiosities to powerful and reliable tools, with a continuous stream of enhancements and extensions. As the world's leading supplier, we have excelled at anticipating customer needs and implementing new capabilities and refinements.

The Dimension 3000, the world's first truly flexible SPM, revolutionized the industry by providing a single system that could meet all of the the needs of most scientists and engineers at an affordable price. The Dimension 3000 took the world by storm, becoming the world's best selling SPM in its first full year of availability. Now we've included enhancements to provide even easier operation, improved functionality, and CE certification.

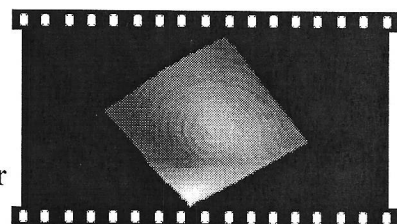


The Dimension 3100: The Most Versatile SPM Ever Manufactured



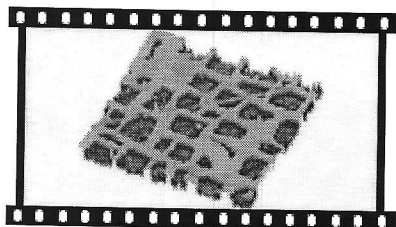
The Dimension 3100 brings together all major SPM techniques in a single, cost-effective platform that handles a wide range of sample sizes and types. It supports all atomic force (AFM) and scanning tunneling (STM) scanning modes, including our patented TappingMode™ technique that protects your samples from damage, our PhaseImaging™ technology that maps differences in surface characteristics and composition, and Magnetic Force Microscopy (MFM) with LiftMode™ to separate magnetic and topographic data. And the Dimension 3100's rigid, low vibration construction ensures the highest quality images and measurements - results that truly represent your samples.

You can scan samples up to eight inches in diameter in ambient air or fluids and use automated stepping to scan multiple areas of your sample without operator intervention. The Dimension 3100 requires little or no sample preparation and our simple vacuum mounting system makes system setup easy and convenient. You also get superior linearity and resolution in all three dimensions, even for your largest samples. In addition, our TrakScan™ laser tracking system accurately tracks the probe tip without moving the laser itself. That means moving fewer parts and less scanner mass for greater stability, enhanced image quality, and optimum measurement accuracy and repeatability. TrakScan technology also decreases the forces on the sample, further reducing the possibility of sample damage. The Dimension 3100 SPM is ideal for semiconductor wafers, lithography masks, magnetic media,



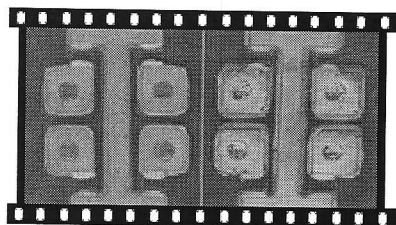
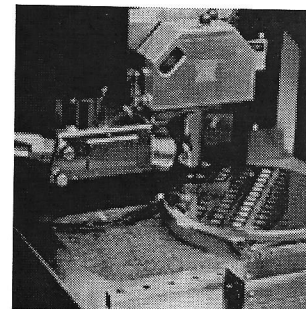
CD/DVD, biomaterials, optics, and other demanding samples.

Designed for Productivity and Value



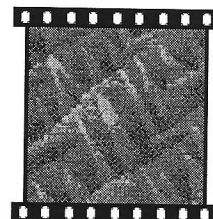
True productivity is the number of images and measurements you can produce in a given time and the quality of the results you generate. So we've built several innovative features into the Dimension 3100 to speed your work and ensure the quality of your results.

Our new laser spot alignment system makes system setup easier than ever. Integrated top-view color video optics - with motorized zoom, computer-controlled illumination, and 1.5 μ m optical resolution - help you quickly and easily identify areas of interest for detailed scanning. Video image capture is also included for easy incorporation of video images in reports and publications.

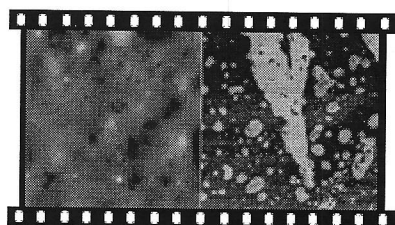


The Dimension 3100 is easily automated with an X-Y stage that is fast and responsive, so locating features is faster and easier than ever. And the Dimension 3100 is available in automated, push-button configurations for LZT bump analysis, PTR measurements, CD/DVD measurements and other high-throughput applications.

The Dimension 3100 SPM's automated, intelligent sample approach and setpoint adjustment save time and prevent damage to your valuable samples. Its rigid, compact design ensures an inherently low noise floor for the clearest images and the truest measurements. And unlike competitive systems, changing scanning techniques, for example from lateral force to force modulation, requires no tools. It's as simple as pointing and clicking with the mouse or attaching a new tip holder. All this and the widely recognized quality of our Dimension Series product line mean you get the best SPM possible at an affordable mid-range price.



We're Making the Future - Join Us!



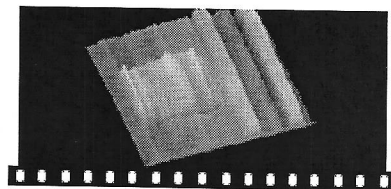
Digital Instruments has been the leader in SPM since we introduced the first commercial SPM in 1987. The Dimension 3100 SPM joins our industry-leading product line, proven in nearly 3,000 installations - more than all competitive systems combined - to be the most productive SPMs available. An investment in a Dimension SPM is a solid investment in your future.

Key Features:

- Scans samples up to eight inches in diameter in air or fluids



- Little or no sample preparation for increased productivity
- Rigid, low vibration construction for superior image quality
- Integrated top-view color video optics with 1.5 μ m resolution and zoom
- Easily changes among all AFM/STM scanning modes/techniques without tools
- Automated stepping for scanning multiple areas unattended
- TrakScan laser tracking system improves image and measurement quality
- Laser spot alignment window for easy setup
- Superior resolution and linearity in all three dimensions
- Ideal for semiconductors, data storage devices, CD/DVD, optics, biomaterials, and other large samples
- Extensive suite of image analysis software
- Optional tip evaluation for flagging bad/worn tips
- Push button tools available for PTR, LZT, CD/DVD, and other measurements
- Mid-range price and maximum value



Specifications

Noise Level:

- <0.5Å RMS in vertical (Z) dimension with acoustic vibration isolation

Microscope:

- Dimension SPM Head
- X-Y imaging area approx. 90 μ m square
- Z range approx. 6 μ m
- Lateral accuracy typically within 1%, maximum 2%
- Provides full 16-bit resolution on all axes for all scan sizes and offsets.

Sample Size:

- Up to 150 mm diameter (up to 200 mm with optional chuck)
- Up to 12 mm thick (adapters available for thicker samples)

Sample Holders:

- Standard 150 mm vacuum chuck for hard disks (48 mm, 65mm, 95mm and 130mm), semiconductor wafers (2", 100mm, 125mm and 150mm), and many other samples; includes interchangeable adapters for centering hard disks and removable wafer locating pins. Vacuum pump included.
- Magnetic small sample holder for samples less than 15mm diameter and 6mm thick
- Optional 200mm vacuum chuck for 150mm and 200mm wafers
- Optional fluid cell allows immersing microscope head in fluid up to 7mm deep

Enhanced Motorized Positioning Stage:

- Inspectable Area 125x100mm; allows coverage of one-half of 150mm wafer without manual sample rotation. Full wafer with manual rotation.
- Resolution 2 μ m
- Unidirectional repeatability: 3 μ m typical, 10 μ m maximum
- Bidirectional repeatability: 4 μ m for x-axis, 6 μ m for y-axis typical
- Optional Manual Stage

Tip/Cantilever Holders:

- Standard Tapping Mode and contact mode holders standard
- Optional holders for force modulation and STM
- Optional tip holder for operation in fluids

Optical Microscope:

- 150 μ m to 675 μ m horizontal viewing area
- Motorized zoom and focus
- Resolution 1.5 μ m
- Computer-controlled illumination
- Video image capture

Tip Viewing:

- Scanning cantilever and sample can be viewed on axis in real time via microscope optics.

Vibration Isolation:

- Silicone vibration pad provided
- Optional vibration isolation table
- Optional integrated vibration isolation table and acoustic enclosure recommended

NanoScope IIIa Controller Electronics:**Facility Requirements:**

- Power: 700 watts (specify at time of order: 100, 120, or 240 volts single phase, 50 or 60Hz)
- Microscope weight: approximately 150 lbs (68Kg)

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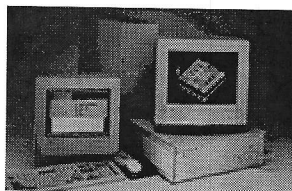
NanoScope Products



NanoScope® IIIa Controller

You may also want to read the [quick feature summary](#) or the [NanoScope® IIIa Controller technical specifications](#).

Unrivalled Experience and Design



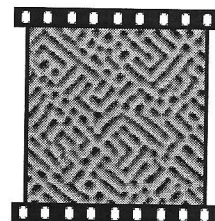
Controller capability and performance are crucial to the productivity of any scanning probe microscopy (SPM) system. That's why Digital Instruments has always made our NanoScope controllers a central engineering focus. We pioneered, patented, and built the first fully digital controllers to provide the functionality, power, and adaptability required in this exploding field. This concept of flexible power gives our users a critical advantage, whether in

research or industry.

The NanoScope IIIa is the direct result of our experience gained in producing more than 1,500 SPMs. We've combined advanced analog and digital circuit designs with premium software and hardware to yield a uniquely powerful SPM controller. The NanoScope IIIa builds on our reputation for real-world productivity and our ability to meet the specialized needs of researchers with unique and custom applications.

Real-world Productivity--A Guiding Principle

Whether you are producing original research or making critical industrial measurements, in today's competitive world there is no substitute for real productivity. Productivity is measured by the number of samples you can analyze in a given time and the quality of the results you generate.



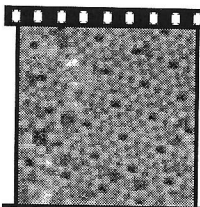
The scientific literature attests to the success of our academic customers: our users produce the overwhelming preponderance of scientific papers presenting SPM data. Any way you look at it -- total number of papers, papers per instrument or papers per year -- our users are the most successful. And in industry, NanoScope throughput and quality of results are unmatched. No one comes close to our number of users, many of whom own multiple NanoScope systems.

For example, in the biological field alone, important research has been done with NanoScopes in the following areas:

- DNA and RNA Analysis
- Protein-Nucleic Acid Complexes
- Chromosomes
- Cellular Membranes
- Proteins and Peptides

- Molecular Crystals
- Polymers and Biomaterials
- Ligand-Receptor Binding

Covering the Fundamentals



We cover the fundamentals essential for high-performance SPM better than anyone else. And then we make sure the hardware and software are fast, easy-to-use, full-featured and flexible.

The fundamentals give you the accurate, reliable data you need; while speed and ease-of-use let you focus on your samples instead of the instrument. Flexibility is important too -- your needs and the techniques you use are subject to change. The NanoScope IIIa provides the versatility you need to keep pace with the rapidly evolving technology of SPM.

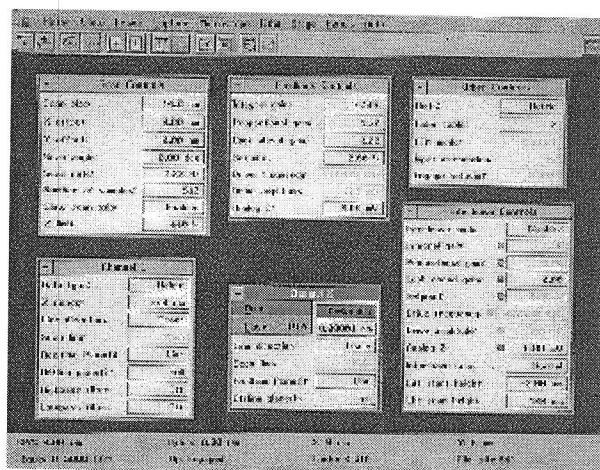
Superior Scan Control Technology

Our proprietary scan control technology is a key example of how we cover the fundamentals. The performance of any SPM system can only be as good as its piezoelectric scanner control system. While this may seem obvious, no other SPM controller can do what the NanoScope IIIa does.

You can zoom from scans of about 100 μ m to a few nanometers without changing scanners or voltage ranges, and always with a full 16 bits of resolution on all scan waveforms and on each axis. NanoScope IIIa linearity is superb regardless of the combination of scan size and offset you use. This is why NanoScope images provide exceptional linearity and noise characteristics no matter how you scan.

Software for Precise and Intuitive System Control

Our software is probably the most important single example of how we designed the NanoScope IIIa controller for productivity. Our real-time control software allows you to change almost any scan parameter without stopping and restarting the scan. You immediately see the effects of changing a parameter, so optimization is a snap. This is a quantum leap over SPM controllers that force you to restart a scan every time you change a parameter; using those less sophisticated systems is like trying to drive a car that you have to stop every time you move the steering wheel.



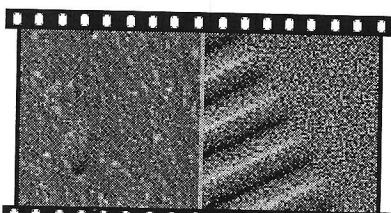
In addition, the NanoScope IIIa computer utilizes a 32-bit operating system that runs fast and supports preemptive interrupts. In contrast, the operating system that is widely-used in competing systems is only 16-bit and does not support preemptive interrupts.

The effect of operating system choice on speed is obvious; handling 32 bits of information at a time is quicker than handling only 16 bits. But perhaps more important is that pre-emptive interrupts are

essential for crash-free real-time control of SPM systems; they direct the computer's attention immediately to the most urgent task in strict order of priority for the SPM (not the unpredictable choice of the operating system). And preemptive interrupts make a true multitasking environment possible. We suggest a simple test for true multitasking: perform complex image processing on previously-acquired data while scanning a new sample and storing the new data to disk. The NanoScope IIIa can do this with ease.

In designing the NanoScope software, we have the advantage of input from the thousands of NanoScope users around the world. The result is the most capable and refined software of any SPM system. And, thanks to programming techniques borrowed from military flight simulators, no other system runs as fast. Using mouse-driven menus within logically-organized windows, you can fly through the commands you need.

Robust and Reliable Hardware

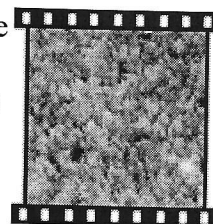


Another way we cover the basics is by constructing the NanoScope IIIa from robust and reliable hardware. This is critical; no matter how good a system looks on paper, if it is broken, its productivity is zero and the instrument is wasting your time.

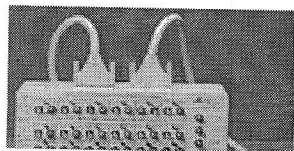
To ensure reliability, we start with premium computer hardware. Then we carefully design and build the interface and controller electronics so they are very low-noise, extremely reliable, and very adaptable. Take a look inside the NanoScope IIIa controller -- you'll like what you see.

Flexible Power--the Freedom to Innovate

NanoScope control systems have always been the choice of researchers who need the flexibility and power to innovate. Separate input channels are available for imaging signals of your own creation -- and to make this easier, the software includes a menu of over twenty calibration parameters that allow you to adapt the NanoScope IIIa to your own custom SPMs. Our users have successfully driven every single UHV/SPM or home-built SPM that they have tried, including several on the leading edge of SPM technology.



The NanoScope IIIa comes with two independent ADCs (analog-to-digital converters), and with the "ADC5" option it can have up to five independent ADCs (fully implemented in V4.2 software). This option also includes front-panel BNCs to access frame and line synch pulses for precisely synchronizing external electronics to SPM scans. The ADC5 option is another example of how the NanoScope IIIa system gives you what you need now while helping you to expand into new areas in the future. And since all NanoScope operations are under software control, new capabilities can be added without changing the electronics. As always, our policy is to send software upgrades to all customers free of charge.



The optional Signal Access Module™ (SAM™) and NanoScript™ automation software further enhance system flexibility. The SAM lets you access every input and output signal between the controller and the microscope. Uses include facilitating the design of new SPMs and SPM